

## Claims

### WHAT IS CLAIMED IS:

1. A method comprising:  
computing a minimum cost path in a stereo disparity model between a scan line of a first image and a corresponding scan line of a second image of a stereo image pair, the stereo disparity model distinguishing between non-fronto-parallel matched pixels in each scan line and occluded pixels in each scan line.
2. The method of claim 1 wherein the computing operation comprises:  
computing matching costs for each pixel of each scan line pair.
3. The method of claim 1 wherein the computing operation comprises:  
computing matching costs for each pixel of each scan line pair using a windowed matching cost function.
4. The method of claim 1 wherein the computing operation comprises:  
altering the matching costs for at least one pixel pair based on whether the pixel pair is determined to be associated with a non-fronto-parallel surface or an occlusion.
5. The method of claim 1 wherein the computing operation comprises:  
determining a minimum cost path in the stereo disparity model.
6. The method of claim 1 wherein the computing operation comprises:  
applying a cost penalty to a move from an occluded pixel pair to a matched pixel pair.

1           7. The method of claim 1 wherein the computing operation comprises:  
2           applying a cost penalty to a move from a matched pixel pair to an occluded  
3 pixel pair.

4           8. The method of claim 1 wherein the computing operation comprises:  
5           applying a cost penalty to a move from an occluded pixel pair to another  
6 occluded pixel pair.

7           9. The method of claim 1 wherein the computing operation comprises:  
8           applying a first cost penalty to a move from an occluded pixel pair to  
9 another occluded pixel pair; and  
10           applying a second cost penalty to a move from a matched pixel pair to an  
11 occluded pixel pair, the first cost penalty being different than the second cost  
12 penalty.  
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14           10. The method of claim 1 wherein the computing operation comprises:  
15           applying a first cost penalty to a move from an occluded pixel pair to  
16 another occluded pixel pair; and  
17           applying a second cost penalty to a move from a matched pixel pair to an  
18 occluded pixel pair, the first cost penalty being less than the second cost penalty.  
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20           11. The method of claim 1 further comprising:  
21           computing a cyclopean virtual image scan line based on corresponding  
22 pixels of the scan lines of the first and second images, a disparity of the  
23 corresponding pixels being characterized by a minimum cost path of the stereo  
24 disparity model.  
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1           12. The method of claim 1 further comprising:  
2           computing a cyclopean virtual image scan line based on corresponding  
3 pixels of the scan lines of the first and second images, wherein corresponding  
4 pixels that are matched are projected as a virtual pixel onto the cyclopean virtual  
5 image scan line.

6           13. The method of claim 1 further comprising:  
7           computing a cyclopean virtual image scan line based on corresponding  
8 pixels of the scan lines of the first and second images, wherein corresponding  
9 pixels that are averaged to determined a value of a resulting virtual pixel on the  
10 cyclopean virtual image scan line.

11           14. The method of claim 1 further comprising:  
12           computing a cyclopean virtual image scan line based on corresponding  
13 pixels of the scan lines of the first and second images, wherein a non-occluded  
14 pixel of an occluded pair of corresponding pixels is projected as a virtual pixel  
15 onto the cyclopean virtual image scan line from a background disparity in the  
16 stereo disparity model.

17           15. The method of claim 1 further comprising:  
18           computing a cyclopean virtual image scan line based on corresponding  
19 pixels of the scan lines of the first and second images, wherein a value of a non-  
20 occluded pixel of an occluded pair of corresponding pixels is selected as a value of  
21 a resulting virtual pixel on the cyclopean virtual image scan line.  
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1           16. A computer program product encoding a computer program for  
2           executing on a computer system a computer process, the computer process  
3           comprising:

4                 computing a minimum cost path in a stereo disparity model between a scan  
5           line of a first image and a corresponding scan line of a second image of a stereo  
6           image pair, the stereo disparity model distinguishing between non-fronto-parallel  
7           matched pixels in each scan line and occluded pixels in each scan line.

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9           17. The computer program product of claim 16 wherein the computing  
10          operation comprises:

11                 computing matching costs for each pixel of each scan line pair.

12           18. The computer program product of claim 16 wherein the computing  
13          operation comprises:

14                 computing matching costs for each pixel of each scan line pair using a  
15          windowed matching cost function.

16  
17          19. The computer program product of claim 16 wherein the computing  
18          operation comprises:

19                 altering the matching costs for at least one pixel pair based on whether the  
20          pixel pair is determined to be associated with a non-fronto-parallel surface or an  
21          occlusion.

22          20. The computer program product of claim 16 wherein the computing  
23          operation comprises:

24                 determining a minimum cost path in the stereo disparity model.  
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1           21. The computer program product of claim 16 wherein the computing  
2 operation comprises:  
3           applying a cost penalty to a move from an occluded pixel pair to a matched  
4 pixel pair.

5           22. The computer program product of claim 16 wherein the computing  
6 operation comprises:  
7           applying a cost penalty to a move from a matched pixel pair to an occluded  
8 pixel pair.

9           23. The computer program product of claim 16 wherein the computing  
10 operation comprises:  
11           applying a cost penalty to a move from an occluded pixel pair to another  
12 occluded pixel pair.

13           24. The computer program product of claim 16 wherein the computing  
14 operation comprises:  
15           applying a first cost penalty to a move from an occluded pixel pair to  
16 another occluded pixel pair; and  
17           applying a second cost penalty to a move from a matched pixel pair to an  
18 occluded pixel pair, the first cost penalty being different than the second cost  
19 penalty.  
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21           25. The computer program product of claim 16 wherein the computing  
22 operation comprises:  
23           applying a first cost penalty to a move from an occluded pixel pair to  
24 another occluded pixel pair; and  
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1       applying a second cost penalty to a move from a matched pixel pair to an  
2       occluded pixel pair, the first cost penalty being less than the second cost penalty.

3       26. The computer program product of claim 16 wherein the computer  
4       process further comprises:

5       computing a cyclopean virtual image scan line based on corresponding  
6       pixels of the scan lines of the first and second images, a disparity of the  
7       corresponding pixels being characterized by a minimum cost path of the stereo  
8       disparity model.

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10       27. The computer program product of claim 16 wherein the computer  
11       process further comprises:

12       computing a cyclopean virtual image scan line based on corresponding  
13       pixels of the scan lines of the first and second images, wherein corresponding  
14       pixels that are matched are projected as a virtual pixel onto the cyclopean virtual  
15       image scan line.

16       28. The computer program product of claim 16 wherein the computer  
17       process further comprises:

18       computing a cyclopean virtual image scan line based on corresponding  
19       pixels of the scan lines of the first and second images, wherein corresponding  
20       pixels that are averaged to determined a value of a resulting virtual pixel on the  
21       cyclopean virtual image scan line.

1           29. The computer program product of claim 16 wherein the computer  
2 process further comprises:

3           computing a cyclopean virtual image scan line based on corresponding  
4 pixels of the scan lines of the first and second images, wherein a non-occluded  
5 pixel of an occluded pair of corresponding pixels is projected as a virtual pixel  
6 onto the cyclopean virtual image scan line from a background disparity in the  
7 stereo disparity model.

8           30. The computer program product of claim 16 wherein the computer  
9 process further comprises:

10          computing a cyclopean virtual image scan line based on corresponding  
11 pixels of the scan lines of the first and second images, wherein a value of a non-  
12 occluded pixel of an occluded pair of corresponding pixels is selected as a value of  
13 a resulting virtual pixel on the cyclopean virtual image scan line.  
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1           31. A system comprising:  
2           a dynamic programming module computing a minimum cost path in a  
3 stereo disparity model between a scan line of a first image and a corresponding  
4 scan line of a second image of a stereo image pair, the stereo disparity model  
5 distinguishing between non-fronto-parallel matched pixels in each scan line and  
6 occluded pixels in each scan line.

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8           32. The system of claim 31 wherein the dynamic programming module  
9 computes matching costs for each pixel of each scan line pair.

10           33. The system of claim 31 wherein the dynamic programming module  
11 computes matching costs for each pixel of each scan line pair using a windowed  
12 matching cost function.

13           34. The system of claim 31 wherein the dynamic programming module  
14 alters the matching costs for at least one pixel pair based on whether the pixel pair  
15 is determined to be associated with a non-fronto-parallel surface or an occlusion.  
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17           35. The system of claim 31 wherein the dynamic programming module  
18 determines a minimum cost path in the stereo disparity model.

19           36. The system of claim 31 wherein the dynamic programming module  
20 applies a cost penalty to a move from an occluded pixel pair to a matched pixel  
21 pair.  
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1           37. The system of claim 31 wherein the dynamic programming module  
2 applies a cost penalty to a move from a matched pixel pair to an occluded pixel  
3 pair.

4           38. The system of claim 31 wherein the dynamic programming module  
5 applies a cost penalty to a move from an occluded pixel pair to another occluded  
6 pixel pair.

7           39. The system of claim 31 wherein the dynamic programming module  
8 applies a first cost penalty to a move from an occluded pixel pair to another  
9 occluded pixel pair and a second cost penalty to a move from a matched pixel pair  
10 to an occluded pixel pair, the first cost penalty being different than the second cost  
11 penalty.  
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13           40. The system of claim 31 wherein the dynamic programming module  
14 applies a first cost penalty to a move from an occluded pixel pair to another  
15 occluded pixel pair and a second cost penalty to a move from a matched pixel pair  
16 to an occluded pixel pair, the first cost penalty being less than the second cost  
17 penalty.  
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19           41. The system of claim 31 further comprising:

20           a cyclopean virtual image generator computing a cyclopean virtual image  
21 scan line based on corresponding pixels of the scan lines of the first and second  
22 images, a disparity of the corresponding pixels being characterized by a minimum  
23 cost path of the stereo disparity model.  
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1           42. The system of claim 31 further comprising:  
2           a cyclopean virtual image generator computing a cyclopean virtual image  
3 scan line based on corresponding pixels of the scan lines of the first and second  
4 images, wherein corresponding pixels that are matched are projected as a virtual  
5 pixel onto the cyclopean virtual image scan line.

6           43. The system of claim 31 further comprising:  
7           a cyclopean virtual image generator computing a cyclopean virtual image  
8 scan line based on corresponding pixels of the scan lines of the first and second  
9 images, wherein corresponding pixels that are averaged to determined a value of a  
10 resulting virtual pixel on the cyclopean virtual image scan line.

11           44. The system of claim 31 further comprising:  
12           a cyclopean virtual image generator computing a cyclopean virtual image  
13 scan line based on corresponding pixels of the scan lines of the first and second  
14 images, wherein a non-occluded pixel of an occluded pair of corresponding pixels  
15 is projected as a virtual pixel onto the cyclopean virtual image scan line from a  
16 background disparity in the stereo disparity model.

17           45. The system of claim 31 further comprising:  
18           a cyclopean virtual image generator computing a cyclopean virtual image  
19 scan line based on corresponding pixels of the scan lines of the first and second  
20 images, wherein a value of a non-occluded pixel of an occluded pair of  
21 corresponding pixels is selected as a value of a resulting virtual pixel on the  
22 cyclopean virtual image scan line.  
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